BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 338 839**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 89303961.0

(22) Date of filing: 20.04.89

(51) Int. Cl.4: G 11 B 20/18
G 11 B 7/00, G 11 B 7/007

(30) Priority: 20.04.88 JP 97491/88

(43) Date of publication of application:
25.10.89 Bulletin 89/43

(84) Designated Contracting States: DE FR GB NL

(71) Applicant: SHARP KABUSHIKI KAISHA
22-22 Nagaike-cho Abeno-ku
Osaka 545 (JP)

(72) Inventor: Deguchi, Toshihisa
2-200-5, Gakuendaiwa-cho
Nara-shi Nara-ken (JP)

Yamaguchi, Takeshi
4, Higashikanenaga-cho
Nara-shi Nara-ken (JP)

Maeda, Shigemi
2996-18, Koizumi-cho
Yamatokoriyama-shi Nara-ken (JP)

Iwaki, Takashi
6-15-505, 1-chome Jingu-cho
Nara-shi Nara-ken (JP)

Fujiwara, Tsuneo
2613-1 Ichinomoto-cho
Tenri-shi Nara-ken (JP)

Terashima, Shigeo
95-86, Nikaido Kaminosho-cho
Tenri-shi Nara-ken (JP)

(74) Representative: Brown, Kenneth Richard et al
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ (GB)

(54) Optical recording medium recording and reproducing device.

(57) A recording and reproducing device providing control data recording area on erasable type optical recording medium wherein control data are recorded thereof, characterized in that there are provided control data recording area forming means for forming control data recording area comprising more than two control recording blocks where more than one record unit are composed and said control data can be recorded independently, and control data updating means for recording a new control data in the control data recording blocks excepting the one where the control data just prior to updating was recorded, when updating the control data in said control data recording area.

Even though device electric power supply may unexpectedly fail, this device is structured to minimize damage caused by such a failure.

Fig.2 (a)

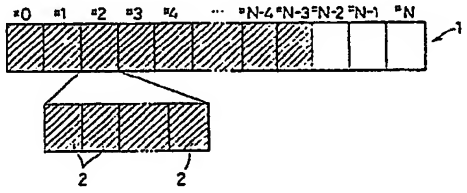


Fig.2 (b)

EP 0 338 839 A2

Description

OPTICAL RECORDING MEDIUM RECORDING AND REPRODUCING DEVICE

FIELD OF THE INVENTION

This invention is related to a recording and reproducing device that can write control data, like an error map, to erasable type optical recording media, like an optical modulation type magneto-optical disk. This recording and reproducing device unit can also update control data.

BACKGROUND OF THE INVENTION

Among recording and reproducing devices with erasable type optical disks possessing commutability (portability), there are units in which an error map can be written to an individual optical disk. Written in this error map is control data for defective sector and track data, for example, and for writing data to alternate locations when defective sectors/tracks exist. A recording and reproducing device like this is structured so that an error map is read to RAM in the unit when the optical disk is inserted. In this manner error map access is performed on the optical disk. As a consequence, when a host device and host program accesses an optical disk via this r cording and reproducing device, even if accessing a defective sector, this will not cause problems to the host device because processing automatically shifts to an alternate sector or the like. When a new defective sector is discovered during accessing, or when it becomes necessary to perform new alternate processing, this recording and reproducing d vice erases and updates the error map.

In conventional optical recording medium recording and reproducing device, the aforementioned error map has been recorded to one specific location on the optical disk.

Now, when rewriting recorded data in an optical modulation type magneto-optical disk recording and reproducing device, it is necessary to erase the area first. Because of this, when an error map is updated in conventional recording and reproducing devices, it is also necessary to record the new error map after erasing the prior error map, which was recorded in the record area of the error map.

Therefore, after erasing the prior error map and before recording the new error map, when, if for some unexpected reason electric power to the device fails, all contents of the error map will be lost. Such problems have occurred.

If the content of the error map is lost, this may offer no problems concerning defective sectors or tracks, but it is extremely difficult to recover alternate data, and may be impossible to read data recorded to an alternate location.

Even with magnetic modulation type magneto-optical disks, or in phase transition type optical disk recording and reproducing devices, if electric power fails during error map erase processing, possibly the same problem can occur.

SUMMARY OF THE INVENTION

An object of this invention is to provide an optical recording medium recording and reproducing device that can minimize damage caused by electric power failure et cetera, by storing control data in the recording medium, without being erased or overwritten, even when unit electric power fails.

Another object of this invention is to provide an optical recording medium recording and reproducing device that can shorten update processing time.

Still another object of this invention is to provide an optical recording recording and reproducing device that can minimize damage caused by electric power failure, when control data is updated.

A further object of this invention is to provide an optical recording medium recording and reproducing device that can easily specify a control data recorded block, where the newest control data is recorded, out of more than 2 control data recorded blocks.

Still a further object of this invention is to provide and an optical magnetic medium recording and reproducing device which can unfailingly record control data.

In order to accomplish these objects, this invention has the following special features:

This is an recording and reproducing device in which a control data recording area, control data that indicates optical recording medium conditions, is set up in the erasable type optical recording medium. It comprises of a means to form a control data recording area, which forms control data recording areas where more than two control data recording blocks are set. These control data recording blocks comprise of more than one record unit, and can independently record control data. The units has a means to update control data which records new control data to the control data recording block, excepting control data recording block where control data was recorded just prior to updating, when control data of the control data recording area is to be updated. This is the special feature.

The aforementioned control data updating means can be structured so that it records new control data in an unrecorded control data recording block when control data of a control data recording area is updated.

Also the aforementioned control data updating means can be structured so that when unrecorded control data recording block does not exist, after new control data was recorded, it erases control data recorded in the control data recording block where the oldest control data was recorded.

Also, the aforementioned control data updating means can be structured so that it records corresponding cyclic code for more than two control data recording blocks in the optical recording medium,

together with control data.

Also, the aforementioned control data updating means can be structured so that it records the number of times for control data recording in the optical recording medium, together with control data.

Also, the aforementioned control data updating means can be structured so that it records total number of control data to the optical recording medium recording and reproducing device, together with control data.

Also, the aforementioned control data recording forming means forms the control data recording area, where more than two control data recording blocks that comprise of more than two record units, are set up. On the other hand, control data updating means can be structured so that it records the same content of control data in more than two record units of a control data recording block.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flow chart illustrating control data updating operation in the optical recording medium recording and reproducing device of this invention.

Fig. 2 (a) (b) are individual maps indicating control data recording areas on the magneto-optical disk.

DESCRIPTION OF THE EMBODIMENTS

The embodiment examples of this invention based on Fig. 1 and Fig. 2 are as follows:

These indicated embodiment examples concern the optical modulation type recording and reproducing device in which a magneto-optical disk is used as the optical recording medium.

The means for forming the control data recording area is designed to form control data recording area 1, where N + 1 units of control data recording blocks are set, as indicated in Fig. 2 (a) (b), on the magneto-optical disk. In the individual control data recording block, #0 - #N address is attached. Here, Fig. 2 (b) indicates a case in which updating of each control data recording block in the control data recording area is done in at least 1 cycle.

The aforementioned control data recording block comprises of multiple sectors of sector 2, which is a record unit, as indicated in Fig. 2 (a), concerning control data recording block of address #2. In this individual sector 2..., the same content of control data is to be recorded, allowing improved reliability.

Also, the aforementioned individual sector 2... can perform independent erase record processing, so N + 1 units of control data recording blocks also can individually and independently perform control data recording.

The control data to be recorded in this control data recording block comprises of an error map, that indicates magneto-optical disk conditions, and includes alternated addresses, when alternate processing is done, and alternate addresses.

The aforementioned alternate process is a process performed when a defective sector is discovered when access executing is done from the host device or host program. The alternated address is the address which indicates a discovered defective sector. The alternate address indicates the normal sector of an alternate location, which will actually be accessed instead of the defective sector, when host device tries to access defective sector again.

When alternated address and alternate address are determined after alternate processing is done, the control data update processing can be done by the control data updating means. In this case, the control data updating means will record new control data to the control data recording block, excepting control data recording blocks of recorded control data just prior to updating.

Here the hatched control data recording blocks indicate blocks where control data is already recorded. Consequently, in Fig. 2 (a), control data recording blocks after address #N-2 are unrecorded. In Fig. 2 (b), only address #2 control data recording block is unrecorded.

The program which controls the control data recording area 1 in the aforementioned control data updating means is designed to read out to RAM. The newest control data, in this embodiment example, is always recorded in a control data recording block located just before the unrecorded control data recording block. For example, in Fig. 2 (a), the control data recording block address #N-3 is the control data recording block where the latest control data is recorded, and in Fig. 2 (b), the control data recording block address #1 is indicated Based on the Fig. 1 flow chart, control data update process operation of the above structured magneto-optical disk recording and reproducing device is explained.

This control data update process, first in step, S1 makes new control data by adding a new alternated address and alternate address to control data in RAM. This sets up the pointer to the first address #0 of the control data recording block in the control data recording area 1 on the magneto-optical disk.(S2)

If a pointer is set up, it examines if the control data recording block of the pointer-located address is unrecorded or not (S3). If this control data recording block is recorded, the pointer advances to the next address by 1, and moves the pointer to the next control data recording block S4). Then it returns to S3, thereafter it repeats S3, processing until the unrecorded control data recording block is discovered.

In the case of Fig. 2 (a) and Fig. 2 (b), by repeating S3 processing N-1 times, or 3 times respectively, the pointer reaches address #N-2, or address #2, which indicates the unrecorded control data recording block. In this embodiment example, control data recording area 1 always has more than 1 unrecorded control data recording blocks, this to be explained later.

In S3, if the control data recording block is determined unrecorded, the new control data in

previously mentioned RAM is recorded in the pointer-indicated control data recording block (S 5). Usually when optical modulation type magneto-optical disks rewrite recording, it is necessary to erase the part first. However, recording in this embodiment example is done in the already unrecorded control data recording block, so an erase operation becomes unnecessary. Even if new control data in RAM is lost, because of electric power failure immediately after alternate processing, the control data thus far is always stored in control data recording area 1.

When new control data recording is completed, S5 ends confirming this data. When new control data recording and confirmation ends, it is determined if the present address pointer indicates the last address #N or not (S6). If not the last address, the pointer address advances by 1, and moves to the next control data recording block (S7).

It is then examined if control data recording block of the pointer-indicated address that advanced by 1 in the above S7 is unrecorded or not (S8). If recorded, the control data recording block of the pointer-indicated address will be erased (S9). In other words, the oldest control data recording block is erased, and the update process ends.

For example, in Fig. 2 (b), if new control data is recorded in the control data recording block of address #2, the control data recording block of address #3 is recorded. So it advances from S8 to S9, and the control data recording block of address #3 will be erased.

In S8, if the control data recording block is unrecorded, it completes update processing as it is. For example, in Fig. 2 (a), if new control data is recorded in the control data recording block of address #N-2, address #N-1 is unrecorded, so according to the decision of S8, update processing is immediately terminated.

On the other hand, in previously mentioned S6, if the address pointer indicates the last address #N when new control data recording and confirmation ends. in other words, when new control data is recorded in the control data recording block of last address #N in S5, and control data recording block of the next address does not exist, it moves to S10.

In S10, after returning the pointer to initial address #0, it moves to S9, and this control data recording block of the first address #0 is erased. In this case as well, the oldest control data recording block is erased. In this way, according to the embodiment example, the oldest control data recording block is erased every time control data is updated. Hence, more than 1 unrecorded control data recording block always exists, as was previously mentioned.

When control data in control data recording area 1 is updated, the recording and reproducing device of this embodiment example can store the previous maximum number of units (N-1 units) updated data, including those prior to updating.

Especially in the case of optical modulation type magneto-optical disks, as in this embodiment example, it is necessary to erase first when recording is to be rewritten. How ver, if previous control data is stored as mentioned above, even if an unexpected electric power failure occurs, damage can be minimized. At the same tim , since the erase operation of the control data recording block is not required until it goes to and returns from control data recording area 1, the update processing time can be shortened.

As mentioned thus far, the optical recording medium recording and reproducing device of this invention is a recording and reproducing device equipped with a control data recording area, where control data indicating optical recording medium conditions are recorded, for an erasable type optical recording medium. It comprises of a means to form a control data recording area, which forms control data recording areas where more than two control data recording blocks are set. It is structured by more than one record unit, and can independently record control data. It has a control data updating means, which records new control data to the control data recording block, excepting control data recording blocks where previously recorded control data was updated when control data of the control data recording area is to be updated. This is the special feature.

The aforementioned control data updating means can be structured so that when control data of a control data recording area is updated, new control data will be recorded in the control data recording block where no control data is recorded.

Also, the aforementioned control data updating means can be structured so that when control data recording blocks, where no recorded control data exists, the control data recording block where the oldest control data is recorded, will be erased.

Also, the aforementioned control data updating means can be structured so that corresponding cyclic code to more than two control data recording blocks are recorded to the optical recording medium, together with the control data.

Also, the aforementioned control data updating means can be structured so that the number of control data recording times is recorded to the optical recording medium, together with the control data.

Also, the aforementioned control data updating means can be structured so that the total number of control data is recorded to the recording and reproducing device, for optical recording medium, together with the control data.

Also, the aforementioned control data recording area forming means forms the control data recording area, where more than two control data recording blocks consisting of more than two record units, are set up. On the other hand, control data updating means can be structured so that the same content of control data is recorded in more than two record units in the control data recording block.

Examples of the aforementioned overwriting type optical recording medium include magnetc-optical disks, phase transition type optical disks and magneto-optical cards et cetera. The control data recording area is an area where control data, for example error map, is to be recorded.

Therefore, the control data recording area forming means forms the control data recording areas.

where more than two control data recording blocks that can independently record control data at optical recording medium format time on the optical recording medium. The control data recording block comprises of more than one record unit, so that more than two control data recording blocks will not process erasing or rewriting at one time. This record unit usually becomes a sector unit.

When the control data of the control data recordi ıg area is updated, the control data updating means records new control data in a control data recording block, excepting the control data recording blocks where control data previously updated was recorded.

Hence, when control data is updated, the control data just previously updated is stored in the optical recording medium, without being erased or overwritten.

Consequently, if the recording and reproducing device of this invention is used, even in cases of electric power failure during update time, since previously updated control data is stored in the optical recording medium, damage can be minimized.

Additionally, when there are no unrecorded control data recording blocks for control data recording, except control data recording blocks where control data was just previously updated, the control data recording block of recorded oldest control data can be used.

In this case, if designated in advance that when all unrecorded control data recording blocks are gone at update time, the oldest control data recorded in control data recording block will be erased, the control data recording block to be recorded will be easily specified at next update time, only by searching the unrecorded sector.

In these cases as well, by recording cyclic codes that correspond to more than two control data recording blocks together in the optical recording medium, the unrecorded control data recording block, or the control data recording block where the oldest control data was recorded, can be easily specified.

At the same time, if the number of control data recordings is recorded in the optical recording medium, the unrecorded control data recording block or the control data recording block where the oldest control data was recorded can easily be specified by determining the remainder of total control data recording blocks from the number of recording times.

Also, in cases where total control data always increases every time an update process is performed, if the totai control data is recorded in the optical recording medium recording and reproducing device together with control data, the control data recording block where the newest control data was recorded can easily be specified by searching control data with the largest total number.

Concerning the number of control data recording blocks, it is sufficient if there are more than two. When the number of control data recording blocks are only two, these blocks can be alternately used for the control data recording blocks to record new control data at every update time.

In addition, the optical recording medium recording and reproducing device of this invention usually comprises of an optical recording medium driver device and a program to control it.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the scope of the invention.

There are described above novel features which the skilled man will appreciate give rise to advantages. These are each independent aspects of the invention to be covered by the present application, irrespective of whether or not they are includ d within the scope of the following claims.

Claims

1. A recording and reproducing device providing control data recording area on erasable type optical recording medium wherein control data are recorded thereof, characterized in that there are provided control data recording area means for forming control data recording area comprising more than two control recording blocks where more than one record unit are composed and said control data are capable of being recorded independently, and control data updating means for recording a new control data in the control data recording blocks excepting the one where the control data just prior to updating was recorded, when updating the control data in said control data recording area.

2. An optical recording medium recording and reproducing device according to claim 1, wherein said control data updating means is arranged to record a new control data in the control data recording blocks where the control data is not recorded, when updating the control data in said control data recording area.

3. An optical recording medium recording and reproducing device according to claim 2, wherein said control data updating means is arranged to erase control data recorded in the control data recording block where the oldest control data was recorded when unrecorded control data recording block does not exist, after new control data was recorded.

4. An optical recording medium recording and reproducing device according to claim 1, wherein said control data updating means is arranged to record corresponding cyclic code for more than two control data recording blocks in said optical recording medium, together with said control data.

5. An optical recording medium recording and reproducing device according to claim 1, wherein said control data updating means is arranged to record the number of times for control data r cording in said optical recording medium, together with said control data.

6. An optical recording medium recording and reproducing device according to claim 1,

wherein said control data updating means is arranged to record the total number of said control data in said optical recording medium recording and reproducing device, together with said control data.

7. An optical recording medium recording and reproducing device according to claim 1, wherein said control data recording area forming means is arranged to form the control data recording area, where there are more than two control data recording blocks that comprise of more than two record units, while said control data updating means is arranged to record the same content of control data in more than two record units of a control data recording block.

8. A system for recording control data in a control data designated area on an erasable data recording medium, the system being adapted to enable updating of the control data using a data updating procedure in which new control data is recorded in a sub-area of said designated area while retaining at least part of any previously recorded control data unerased from said designated area.

9. A system according to claim 8, the system being so arranged that in the updating procedure the new control data is recorded in a previously unoccupied sub-area and so that if the recording of the new control data results in the designated area being filled, a sub-area containing previously recorded control data is cleared by data erasure to provide an unoccupied sub-area in readiness for the next performance of the updating procedure.

10. A system according to claim 9 wherein the sub-area which is cleared is the one containing the oldest recorded control data.

Fig. 1

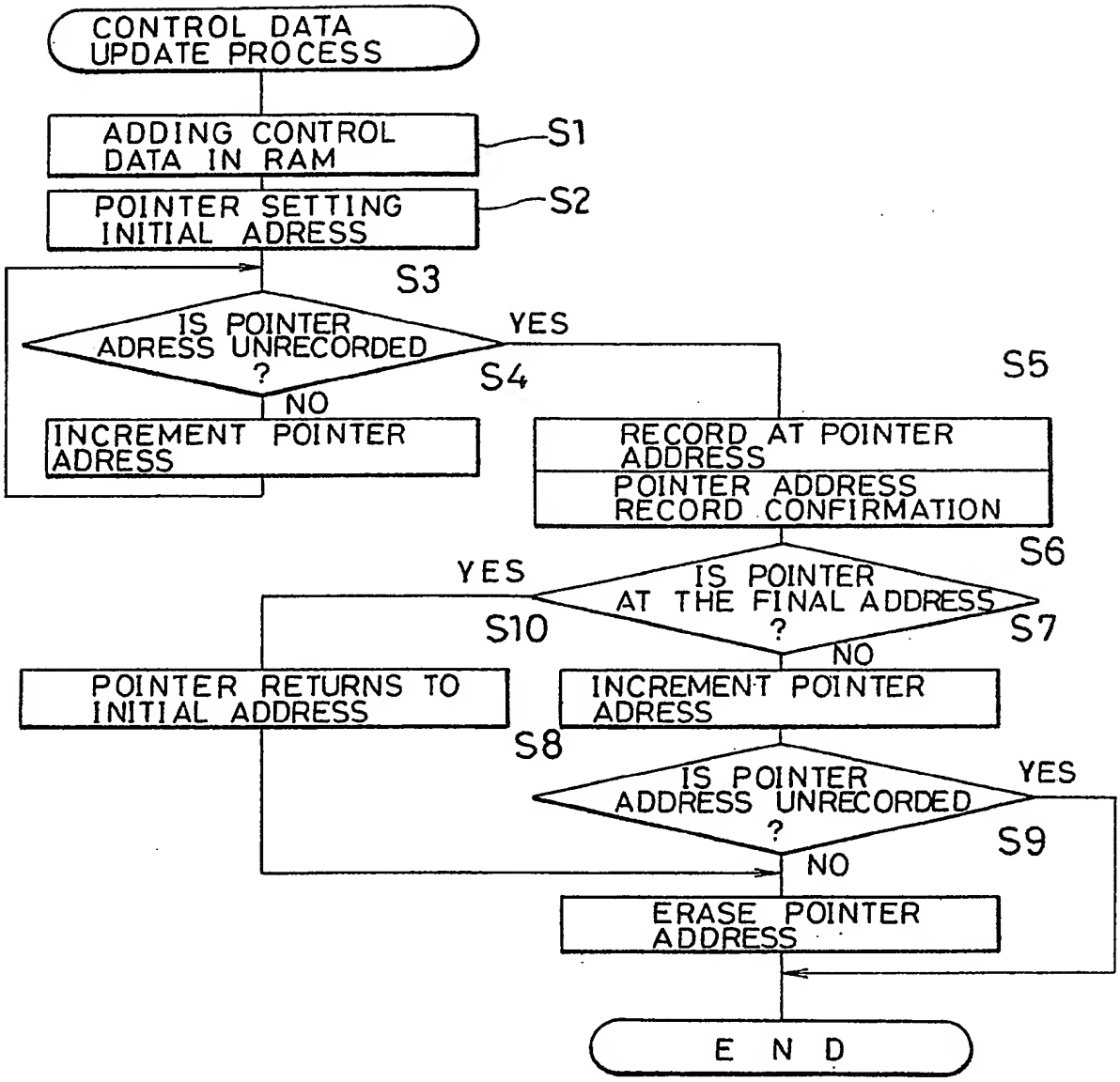


Fig.2 (a)

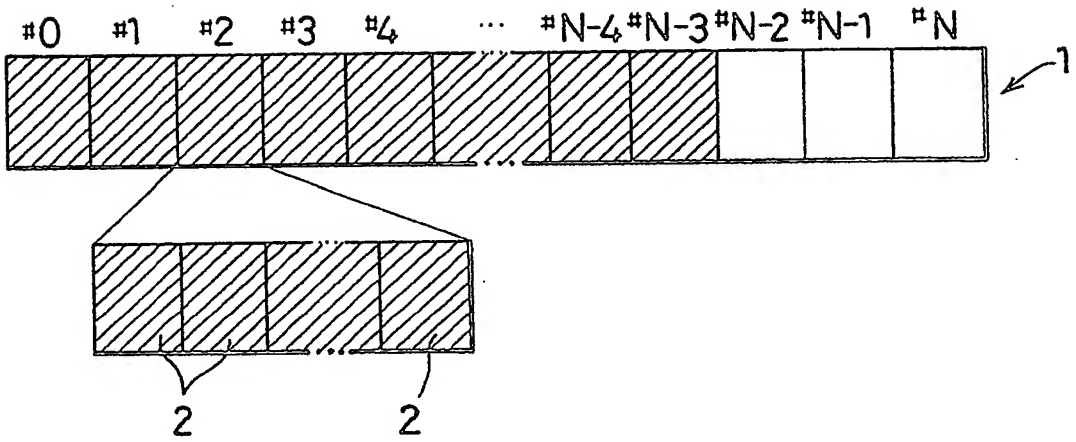
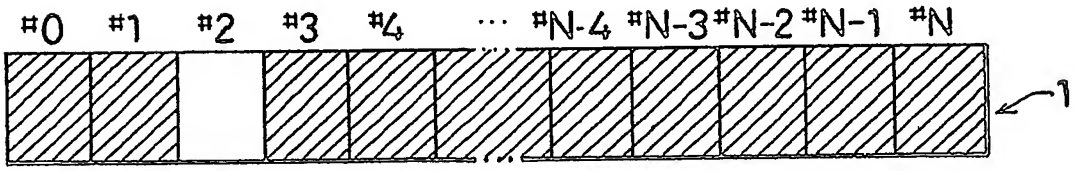


Fig.2 (b)



(19) Europäisches Patentamt
Eur pean Patent Office
Office européen d s brevets

(11) Publication number: **0 338 839 A3**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **89303961.0**

(22) Date of filing: **20.04.89**

(51) Int. Cl.5: **G11B 20/18**, G11B 7/00, G11B 7/007

(30) Priority: **20.04.88 JP 97491/88**

(43) Date of publication of application:
25.10.89 Bulletin 89/43

(84) Designated Contracting States:
DE FR GB NL

(88) Date of deferred publication of the search report:
17.04.91 Bulletin 91/16

(71) Applicant: **SHARP KABUSHIKI KAISHA**
22-22 Nagaike-cho Abeno-ku
Osaka 545(JP)

(72) Inventor: **Deguchi, Toshihisa**
2-200-5, Gakuendaiwa-cho
Nara-shi Nara-ken(JP)
Inventor: **Yamaguchi, Takeshi**
4, Higashikanenaga-cho
Nara-shi Nara-ken(JP)
Inventor: **Maeda, Shigemi**
2996-18, Koizumi-cho
Yamatokoriyama-shi Nara-ken(JP)
Inventor: **Iwaki, Takashi**
6-15-505, 1-chome Jingu-cho
Nara-shi Nara-ken(JP)
Inventor: **Fujiwara, Tsuneo**
2613-1 Ichinomoto-cho
Tenri-shi Nara-ken(JP)
Inventor: **Terashima, Shigeo**
95-86, Nikaido Kaminosho-cho
Tenri-shi Nara-ken(JP)

(74) Representative: **Brown, Kenneth Richard et al**
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ(GB)

(54) **Optical recording medium recording and reproducing device.**

(57) A recording and reproducing device providing control data recording area on erasable type optical recording medium wherein control data are recorded thereof, characterized in that there are provided control data recording area forming means for forming control data recording area comprising more than two control recording blocks where more than one record unit are composed and said control data can be recorded independently, and control data updating means for recording a new control data in the control data recording blocks excepting the one where the control data just prior to updating was recorded, when updating the control data in said control data recording area.

Even though device electric power supply may unexpectedly fail, this device is structured to minimize damage caused by such a failure.

Fig.2 (a)

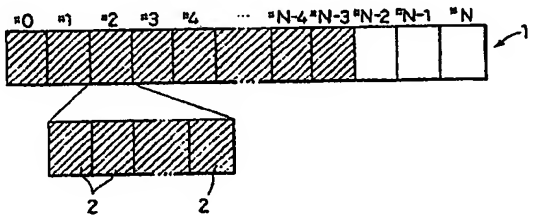
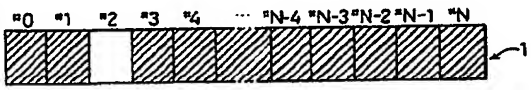


Fig.2 (b)



EP 0 338 839 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 3961

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
E	EP-A-321251 (SHARP K.K.) * the whole document *	1-3	G11B20/18 G11B7/00 G11B7/007
A	DE-A-3728857 (K.K. TOSHIBA) * column 7, line 33 - column 8, line 36 * * column 11, lines 32 - 51; figure 5 *	1	
A	DE-A-3721027 (HITACHI LTD) * the whole document *	1	
A	IBM TECHNICAL DISCLOSURE BULLETIN. vol. 29, no. 4, September 1986, NEW YORK US pages 1585 - 1590; "Method for reallocation control" * page 1585, line 1 - page 1586, line 5 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

G11B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 JANUARY 1991	KELPERIS K.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

2